

2 SUMMARY OF BACKGROUND INFORMATION

2.1 RESOURCES OF LONG ISLAND SOUND

Connecticut is unique among all coastal states in the U.S. in that it is the only state whose entire coastal submerged land (Long Island Sound) is an estuary, a partially enclosed body of water formed where freshwater from rivers and streams flows into and mixes with ocean water. The tidal, sheltered waters of estuaries support unique communities of plants and animals. Estuarine environments are among the most diverse and productive on earth, creating more organic matter each year than comparably-sized areas of forest, grassland, or agricultural land.¹⁰ Long Island Sound provides a unique habitat that is cool enough to support some northern species at their southern extent, and warm enough to support some southern species at their northern extent. The ecology of Long Island Sound is dynamic and can be significantly changed with only small changes in temperature. Birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce. Numerous marine organisms, including most commercially valuable fish and shellfish species, depend on estuaries at some point during their development.

Besides serving as the “nurseries of the sea” and an important habitat for wildlife, freshwater and tidal wetlands that fringe many estuaries also filter sediments and pollutants from water draining from upland rivers and streams. Wetland plants and soils also act as a natural buffer between the land and ocean, absorbing floodwaters and dissipating storm surges. Tidal wetland grasses and other estuarine plants also help prevent erosion and stabilize the shoreline. In addition to these functions, the sheltered environment of estuaries and Long Island Sound, in particular, create unique scenery, as well as cultural and recreational opportunities. Research commissioned by the Long Island Sound Study (LISS), a cooperative program initiated by the federal government, Connecticut, and New York in 1985, estimated that more than \$5 billion is generated annually in the regional economy from boating, commercial and sport fishing, swimming, and beachgoing within and along Long Island Sound.

Long Island Sound and portions thereof have been bestowed with many honors, for example, Congress designated Long Island Sound as an “Estuary of National Significance” in 1987 under the National Estuary Program, The Nature Conservancy named the Lower Connecticut River Tidelands as one of the 40 Last Great Places, and former Environmental Protection Agency (EPA) Administrator Carol Browner stated that “Long Island Sound is a national treasure and one of the nation’s most important waterways”.¹¹ There have been numerous and varied efforts to protect and restore Long Island Sound, from bi-state undertakings like the LISS Comprehensive Conservation

¹⁰ U.S. EPA National Estuary Project, <http://www.epa.gov/owow/estuaries/about1.htm>

¹¹ Long Island Sound Taskforce, “Signing on Long Island Sound Makes History,” Save the Sound (Stamford: Long Island Sound Taskforce, 1994).

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Management Plan¹² and the Long Island Sound Stewardship System,¹³ to a multitude of academic, governmental, and public interest group endeavors.¹⁴ Federally, a number of legislative initiatives have protected and provided funding for Long Island Sound research, protection, and restoration.¹⁵ As custodian for half of Long Island Sound, Connecticut has an obligation to continue to protect and preserve this irreplaceable resource.

2.1.1 Overview of Long Island Sound

Long Island Sound is 110 miles long and 21 miles across at its widest point, with a total area of 1,300 square miles and a volume of 2.19 trillion cubic feet. Major rivers in its drainage basin include the Housatonic, Quinnipiac, Connecticut, and Thames. Its 16,000 square mile drainage basin includes much of New England, as well as Long Island. More than 21 million people live within 50 miles of the Long Island Sound, and more than eight million people live within its watershed, with the coastal areas being among the most populated.¹⁶

Long Island Sound can be divided into three major basins: eastern, central, and western. The eastern basin is the deepest (depths up to 300 feet) and narrowest, influenced by exchange with ocean water of Block Island Sound (Appendix C, Figure C-6). The central basin is the widest, with depths gradually increasing from the Connecticut shore to 100 to 130 feet. Reefs and islands are common along the Connecticut shoreline in both the central and western basins (Appendix C, Figure C-5). The Stratford shoal, a shallow area located mid-Sound, limits water circulation between the central and western basins. The western basin has typically shallower depths, and a predominantly mud substrate. Farthest west is an area called the Narrows, which is bisected by the Hempstead Sill, a shallow submerged bedrock ridge.

¹² The CCMP was designed to protect and improve the health of Long Island Sound while ensuring compatible human uses within Long Island Sound's ecosystem. It prioritized some problems affecting Long Island Sound (hypoxia, toxic contamination, pathogen contamination, floatable debris, health of living resources, and land use and development) while also making recommendations "to improve water quality, protect habitat and living resources, educate and involve the public, improve the long-term understanding of how to manage Long Island Sound, monitor progress, and redirect management efforts." <http://www.epa.gov/region01/eco/lis/ccmp/intro.html>.

¹³ A network of exemplary areas that encompass Long Island Sound's most significant ecological, open space and/or public access values. (Save the Sound, Regional Plan Association and Audubon NY in conjunction with USFWS).

¹⁴ See Appendix I.

¹⁵ Examples include the Estuaries and Clean Waters Act (1987): (CT & NY directed in 1985 by Congress to establish the LISS, and Long Island Sound was one of the six original estuaries designated); the Estuaries and Clean Waters Act of 2000 (S.835); the Water Resources Development Act – amended in 2000; and the Ambro Amendment to the Ocean Dumping Act (Marine Protection, Research and Sanctuaries Act).

¹⁶ <http://www.epa.gov/nep/kids/visit/lis3.htm> and <http://www.epa.gov/nep/programs/lis.htm>.

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2.1.2 Geology and Geological History

The Long Island Sound estuary began to take on its present shape approximately 26,000 years ago during the late Wisconsin age glaciation. As the last glacier entered the area of Connecticut, Connecticut's bedrock uplands and the coastal plain sediments, which had eroded from the bedrock, were smoothed and modified by the moving ice. A terminal moraine of assorted glacial debris accumulated along the front of the ice. As the glacier melted, it periodically slowed or stopped its retreat. During one such pause between about 21,500 and 17,500 years ago, the Orient Point-Fishers Island moraine was deposited as a dam of glacial till across the east end of the lowland. Glacial meltwater collected behind the moraine, and freshwater Glacial Lake Connecticut formed. Sea level was 300 feet lower than it is today. Between 17,500 and 15,500 years ago, the glacier continued to melt, and Glacial Lake Connecticut drained away through the eroded moraines. The remaining moraine became Long Island. Thick, glacial lake-clay deposits, which today underlie portions of Long Island Sound, were exposed in the lowland between the moraine and the mainland by the time Connecticut was nearly ice-free. Glacial melting was accompanied by a rise in sea level. Between 15,500 and 5,000 years ago, rising ocean waters entered the lowland from the east and the Long Island Sound estuary began to evolve. Over the last few thousand years, tidal marshes and beaches have developed, as Long Island Sound assumed its present features. The rivers that drain much of New England continue to discharge sediments into Long Island Sound, and these recent sediments overlie the older glacial deposits.

Surficial Sediment Distribution

The distribution of surficial sediments in Long Island Sound reflects the original depositional history of the coastal plain, glacial, and recent sediments, and the reworking and redistribution of these sediments due to the effect of the circulation pattern of tides and currents. The circulation patterns in Long Island Sound create a succession of sedimentary environments (Appendix C, Figure C-22). Circulation in Long Island Sound is controlled by an east-to-west weakening of tidal-current speeds coupled with the westward-directed estuarine bottom drift. As a result, the succession begins with erosion or nondeposition at the narrow eastern entrance to Long Island Sound and changes to an extensive area of coarse-grained bedload transport in the east-central Long Island Sound. Consequently, gravelly sediments are dominant in easternmost Long Island Sound, where tidal currents are strong. In the east-central portion of Long Island Sound where the estuary noticeably widens, is a contiguous band of sediment sorting characterized by sand deposits. These areas transition into broad areas of fine-grained deposition on the flat basin floor in the central and western Long Island Sound. Silty, sand, and sand-silt-clay mark the transitions within the Long Island Sound from higher to lower energy environments, such as on the flanks of bathymetric highs. Clayey silt and silty clay are predominant in low-energy environments, such as on the floors of the central and western basins (Appendix C, Figure C-20).

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Contaminant Distribution and Accumulation in Sediments

Trace metal contamination of sediments from land-based activities is found throughout Long Island Sound and its watershed. The distribution of these contaminants is controlled not only by the locations of sediment discharge, such as outfalls and surficial runoff, but also by the reworking of sediments by tides and currents. Water currents tend to rework fine-grained sediments and the contaminants associated with them and transport them to low energy, depositional areas. The U.S. Geological Survey (USGS) collected samples of surface sediments in 1996 to measure amounts and locations of metal contaminants and to establish a baseline for identifying changing conditions.¹⁷ The concentration distributions of these elements correlates with the sedimentary environment, the sediment texture, the organic carbon content, and the abundance of *Clostridium perfringens*, a bacterium used as a sewage tracer. Among the observations, average concentrations of silver and copper in Long Island Sound were four to five times greater than naturally-occurring background values. Zinc, lead, and manganese concentrations were enriched 1.5 to 2 times greater than natural background levels. Consistent with the sedimentary environments, the greatest enrichment of metals is found in the depositional environments and muddy sediments of the central and western basins, due to both proximity to pollutant sources and the natural movement of sediments and contaminants within Long Island Sound. Total Organic Carbon concentrations, at least partially indicative of pollutant additions, also vary across Long Island Sound, with higher concentrations towards the western end of the basin (Appendix C, Figure C-23).

The USGS also collected sediment cores throughout Long Island Sound. Because recently deposited sediments overlie older sediments, such cores provide a means of investigating historical conditions. Measurements of mercury and of *Clostridium perfringens* in cores show the onset of anthropogenic contamination two centuries ago and the effects of the increase in a regional human population since then. Concentrations of metal contaminants have decreased in recent decades, but *Clostridium perfringens* has not.

2.1.3 Water Quality

The water quality of Long Island Sound is a function of the exchange of saline water from the offshore waters of the New York Bight¹⁸ and the inflow of freshwater from the uplands and shorelands surrounding Long Island Sound. Unlike most other estuaries, Long Island Sound has two connections with the sea. Lower salinity waters enter the western Long Island Sound from New York Harbor through the East River and the Harlem River, and higher salinity waters enter the eastern end through Block Island Sound and The Race.¹⁹ The highly convoluted shoreline and complex bottom topography

¹⁷ Buchholtz ten Brink, M.R., Knebel, H., Poppe, L., Casso, M., and Varekamp, J.C., 1996, Contaminant distribution in Long Island Sound sediments [abs.]: U.S. Geological Survey Field Studies, Long Island Sound Research Conference, Program with Abstracts, Avery Point, Conn., October 1996.

¹⁸ Area of Long Island Sound located between Long Island and the New Jersey coast, including the Hudson River outer harbor.

¹⁹ Area of Long Island Sound, which is a channel between Fishers Island and Long Island.

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(Appendix C, Figure C-6) combined with the unique inflow patterns of Long Island Sound create complex tides and currents. Roughly 90% of the freshwater inflow to Long Island Sound comes from three Connecticut rivers: the Thames, the Housatonic, and the Connecticut.

Direct and indirect sources of pollution to Long Island Sound include sewage treatment plants, industrial discharges, and nonpoint sources (urban and agricultural runoff, atmospheric deposition). Non-point and point sources of pollution may be carried to Long Island Sound from distant locations including Massachusetts, Vermont, and New Hampshire. Coastal activities including port and marina operations and boating may also result in contributions of pollutants, the effects of which can be felt locally within poorly mixed tidal estuaries, or they can be problematic across large areas of Long Island Sound. The sources and causes of degradation are varied and complex.

The Long Island Sound Comprehensive Conservation and Management Plan (CCMP) developed in 1994 as part of the LISS identifies low dissolved oxygen (DO), or hypoxia, as the most serious water quality impairment in Long Island Sound. As defined by the LISS, hypoxia exists when DO drops below a concentration of 3 milligrams per liter (mg/L), although ongoing national research suggests that there may be adverse effects to organisms even above this level. Warming temperatures in combination with thermal stratification of the water column can lead to hypoxia and anoxia (dissolved oxygen less than 0.2 mg/l). While low oxygen levels can occur naturally in estuaries during the summer, when still weather conditions prevent the mixing of the water column that replenishes bottom water oxygen during the rest of the year, studies for Long Island Sound suggest that summer oxygen depletion in western Long Island Sound is significant. DO levels follow seasonal patterns with a decrease in bottom water DO over the course of the summer. Hypoxic conditions during the summer are mainly confined to the Narrows and western Basin of Long Island Sound.²⁰ Those areas comprise the section of Long Island Sound west of a line from Stratford to Port Jefferson, Long Island. The maximum extent of the hypoxic condition typically occurs in early August and affects 472 square kilometers (km²) (189 square miles) on average.²¹ The primary cause of this hypoxia is consumption of oxygen due to the death and decay of phytoplankton, which are stimulated to excessive growth by nutrient additions (especially nitrogen) from anthropogenic sources.

To address this problem, the LISS is implementing a phased approach to reducing nitrogen loads to Long Island Sound from sewage treatment plants, industrial discharges, and nonpoint sources. These phased nitrogen reductions, however, may not raise dissolved oxygen to levels necessary to support all life stages of marine organisms in Long Island Sound. Additional measures will likely be required to achieve the state's water quality standards for dissolved oxygen. These measures may include advanced treatment at sewage treatment plants and reductions in atmospheric nitrogen loadings, the primary sources of which are emissions generated by various combustion processes that use fossil fuels (e.g., electric generation, fueling of motor vehicles and other machinery).

²⁰ DEP Water Quality Monitoring Page: http://dep.state.ct.us/wtr/lis/monitoring/lis_page.htm.

²¹ DEP Monitors Long Island Sound page: <http://dep.state.ct.us/wtr/lis/monitoring/monsum.htm>.

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The U.S. Environmental Protection Agency (EPA) recently approved (April 2001) the total maximum daily load (TMDL), submitted by DEP and the New York State Department of Environmental Conservation (NYSDEC) for Long Island Sound,²² which allocates responsibility for reducing nitrogen loads among all nitrogen sources. The TMDL is consistent with the LISS bi-state agreement that establishes a 58.5% reduction in nitrogen loads by 2014.

The water quality and ecology of Long Island Sound are affected by a variety of human activities that result in nitrogen pollution, sediment contamination, habitat degradation and loss, and effects to the health and abundance of living resources. The LISS recently released its first comprehensive public report on the health of Long Island Sound in April 2001.^{23,24} Among the improvements pointed to:

Upgrades to sewage treatment plants have decreased their discharge of nitrogen to Long Island Sound by 19% since 1990.

Severity of hypoxia (lack of oxygen) has decreased in Long Island Sound since the late 1980s.

Levels of copper, nickel, lead, and zinc as well as many organic compounds have declined in the monitored harbors of Long Island Sound.

Toxic industrial chemical releases in Long Island Sound's watershed have declined 83.5% between 1988 and 1998.

In the past two years, 33.4 river miles have been opened to anadromous fish and 593 acres of coastal habitat have been restored.

Among the concerns highlighted in the report are:

A die-off of lobsters over the last two years, most severely in the western Long Island Sound, has greatly reduced the harvest.

Since 1997, two parasitic diseases, MSX and Dermo, have decimated the oyster industry.

Bluefish, winter flounder, and tautog stocks are below the long-term average and have not yet responded to more stringent management measures that were recently implemented.

²² Letter to Arthur J. Rocque, Commissioner, DEP dated April 3, 2001 from Ira Leighton, Action Regional Administrator EPA New England and William J Muszynski, Acting Regional Administrator, EPA Region 2. <http://www.epa.gov/region01/eco/lis/pdf/Tmdl.approval.pdf>.

²³ Sound Health 2001: Status and Trends in the Health of Long Island Sound. News Release March 5, 2001.

Mark Tedesco, EPA Long Island Sound Office, U.S. Environmental Protection Agency.

²⁴ <http://www.epa.gov/region01/eco/lis/facts/fact15.pdf>.

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Colonial bird populations, such as the piping plover and least tern, are still threatened by human intrusion into nesting areas, loss of habitat, and predators.

2.1.4 Ecology

The ecological diversity and habitat types within Long Island Sound are a result of the local geology and sedimentology, bathymetry, currents and tidal regime, coastal morphology, freshwater inflow, and human activities and impacts. The purpose of this section is to describe the breadth of resources in Long Island Sound, as well as their scarcity, sensitivity, and importance, as directed by PA No. 02-95 Section 3(B).

Vegetation

Vegetation in Long Island Sound includes vascular plants in brackish and tidal wetlands, and submerged aquatic vegetation in the form of seagrasses including eelgrass, and algae.

Tidal wetlands Shoreline habitats along Long Island Sound frequently contain coastal wetlands. (Appendix C, Figure C-2). These vegetated areas have unique types of vegetation, depending on the elevation and associated frequency and duration of tidal inundation, as well as the salinity. The most common vegetation type is saltwater cord grass (*Spartina alterniflora*), which forms a band along the well-inundated intertidal areas of the marsh. Saltmeadow cordgrass (*Spartina patens*) occurs at higher elevations, frequently in association with spike grass (*Distichlis spicata*).

These areas are important in terms of buffering the coastline from erosion, and in filtering excessive nutrients and any associated contaminants. They are highly productive in terms of plant material, which allow the support of dense populations of macroinvertebrates. This productivity provides nursery areas for fish and shellfish, and habitats for birds, mammals, and invertebrates. Over the past 100 years, approximately 4,900 acres (30%) of Connecticut's tidal marshes have been lost or degraded due to development.²⁵ An additional 10% of Connecticut's tidal wetlands are impacted by causeways, bridges, and roadways that do not allow sufficient tidal flushing. Historic ditching for mosquito control led to deterioration of some natural tidal wetland communities. Vegetative diversity in marshes has been further compromised by the invasion of reedgrass (*Phragmites australis*) and to a lesser extent by the narrow-leaved cattail (*Typha angustifolia*). Reedgrass is becoming more prominent in the Connecticut River estuary, converting tidal wetland at the rate of 1 to 2% per year. In addition, rising sea level threatens to drown some tidal wetlands. Through comprehensive management, the DEP has restored over 1,600 acres of tidal wetlands.

Eelgrass Like meadows of grasses or forests of trees, seagrass beds are primary producers. Seagrass beds, including eelgrass beds are shallow and complex

²⁵ Fell, P.E., R.S. Warren, and W.A. Niering. 2001. Restoration of salt and brackish tidelands in Southern New England, p. 845-859, in M.A. Weinstein and D.A. Kreeger, eds., Concepts and Controversies in Tidal Marsh Ecology. New York: Kluwer Academic Press.

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environments. Eelgrass (a type of seagrass) habitats are among the most productive ecosystems, providing functions that include food, refuge, and shelter for commercially, recreationally, and ecologically important species.²⁶ In Long Island Sound, the predominant species of eelgrass is *Zostera marina*. Eelgrass beds once occurred in shallow (generally less than 130 feet) protected waters throughout Long Island Sound, but now occur only along the eastern third of the Connecticut shore, from Clinton to the Rhode Island border.^{27,28} (Appendix C, Figure C-11). The distribution of eelgrass is restricted to the photic zone, the depth where light penetrates. This depth is affected by factors such as water depth, tidal range, and level of eutrophication.

Nitrogen enrichment from wastewater treatment plants is suspected to have contributed to the long-term decline of eelgrass in Long Island Sound along with wasting disease, storms, swan consumption, eutrophication, and land-use changes.

Macroalgae Macroalgae, or seaweeds, a type of rootless plant, occur in hard substrate areas where available light allows plants to grow. Seaweeds are often the dominant organisms in rocky shallow waters, both intertidal (Appendix C, Figure C-1) and shallow subtidal (Appendix C, Figure C-5).

Rocky intertidal shoreline habitats are typified by macroalgae. These species form a habitat for other attached algae and macroinvertebrates. Common intertidal species include rockweeds such as *Fucus vesiculosus*, knotted wrack (*Ascophyllum nodosum*), and Irish moss (*Chondrus crispus*), which are distributed in distinct bands depending on tidal elevation. Rocky intertidal habitats are exposed to highly variable environmental conditions, including widely ranging salinity, temperature, and wave energy.

Hard substrate in shallow subtidal areas of Long Island Sound (Appendix C, Figure C-5) is colonized by attached algae, including taller canopy species such as kelps, which overlay lower understory species. The species composition depends largely on depth. Subtidal macroalgae are important for forming one of the most diverse and productive communities. Kelp beds provide habitat and refuge for species that include blue and horse mussels, juvenile lobsters, and larger macroinvertebrates. This community is sensitive to reductions in light transmission caused by increases in suspended solids.

Invertebrates

Invertebrates in Long Island Sound can be divided into planktonic, those organisms dwelling in the water column, and benthic, those that dwell on the bottom. The focus of this discussion is on benthic invertebrates, as they could potentially be affected by

²⁶ Thayer, G.W., W. J. Kenworthy, and M.S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic Coast: A Community Profile. U.S. Fish. Wildlife Service FWS/OBS-84/02.

²⁷ Koch, E.W. and S. Beers. 1996. Tide, light, and distribution of *Zostera marina* in Long Island Sound, USA. *Aquatic Botany* 53: 97-107.

²⁸ Ernst, L.M. and C.D. Stephan. State Regulation and Management of Submerged Aquatic Vegetation along the Atlantic Coast of the United States, in C.D. Stephan and T. Bigford, eds., *Atlantic Coastal Submerged Aquatic Vegetation: A review of its ecological role, anthropogenic impacts, state regulation, and value to Atlantic Coastal Fish Stocks*. ASMFC Habitat Management Series #1.

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submarine construction and operation of energy and telecommunications infrastructure projects.

Substrate and depth are the predominant factors affecting invertebrate communities,²⁹ creating what is termed “benthoscapes”.³⁰ Sediment grain size in particular affects the distribution of invertebrates, which in turn is the result of a combination of geologic and hydrologic processes. These factors include large-scale circulatory patterns, combined with meteorological disturbances, medium scale tidal flows, and riverine inputs.³¹ Variable patterns in recruitment create additional variations in community structure. Soft sediments form the predominant substrate type in Long Island Sound (Appendix C, Figure C-20.). Depth zones include intertidal (i.e., mud flats), shallow subtidal (less than 15 feet) and deep (15 feet and greater). A 1983 Sound-wide survey found 15 different benthic communities, largely based on depth and sediment grain size.³²

However, a “snapshot” such as this study does not take into account the temporal and smaller-scale spatial patterns typical of Long Island Sound. One viewpoint relies on principles of landscape ecology to explain small, medium, and large scale spatial and temporal variations in benthic community structure.³³

Another viewpoint focuses on the role of disturbance in creating successional stages in benthic communities. The number and type of organisms change based on the degree of environmental disturbance or stress.³⁴ Communities typically progress from a Stage I or early successional stage, typified by an abundance surface dwelling, resilient or opportunistic species that are rapidly established, followed by a transitional Stage II community, that includes species such as the clams *Tellina agilis* and *Nucula annulata*. The final stage is a mature community typified by large, deep dwelling, subsurface deposit feeding species that include polychaete worms (*Nephtys incisa*) and razor clam (*Ensis directus*). The successional stage of the community becomes important when estimating the level and time frame for recovery from potential impacts. While useful to explain invertebrate communities in central Long Island Sound, this explanation may oversimplify Sound-wide invertebrate communities.³⁵ Commercially important benthic invertebrates are discussed below.

Crabs

²⁹ Sanders, H.L. 1956. *Oceanography of Long Island Sound*. X. The biology of marine bottom communities. *Bull. Biog. Ocean. Coll.* 15: 245-258.

³⁰ Zajac, R.N., R.S. Lewis, L.J. Poppel, D.C. Twitchell, J. Vazarik, and J.L. DiGiacomo-Cohen. 2000. Relationships among sea-floor structure and benthic communities in Long Island Sound at Regional and Benthoscape Scales. *J. Coastal Research* 16(3): 627-640.

³¹ *Ibid.*

³² Pelligrino, P. and W. Hubbard. 1983. Baseline shellfish data for the assessment of potential environmental impacts associated with energy activities in Connecticut's coastal zone. Volumes I and II. Report to Connecticut Dept. of Agriculture, Aquaculture Division.

³³ Zajac *et al.* 2000.

³⁴ Rhoads, D.C., P.L. McCall, and J.Y. Yingst. 1978. Disturbance and production on the estuarine seafloor. *Am. Sci.* 66: 577-586.

³⁵ Zajac *et al.* 2000.

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Recreational surveys indicate important crabs in Long Island Sound include spider, lady, rock, blue and flat claw hermit.³⁶ Most abundant are lady crab (most abundant in fall), followed by rock crab (most abundant in spring); the remainder are relatively uncommon. Lady crab catches show evidence of a recent decline, with 2001 catches the lowest since 1992. Spring spider crab and rock crab catches have also been decreasing since 1994-1996.

The horseshoe crab (*Limulus polyphemus*) is an arthropod in the class Merostomata, more closely related to spiders than crabs. They are second only to lobster in abundance in the DEP trawl surveys.³⁷ Mating occurs in deep waters, and eggs are laid in the intertidal zone in spring. Juveniles and some adults inhabit intertidal sand and mud flats. Many adults move to deeper water.

Fish, Including EFH Species

Finfish are commercially and recreationally important, as well as important components of the diverse food webs in Long Island Sound. Fish inhabit all of the various habitats of Long Island Sound, including tidal wetlands, intertidal mud flats and rocky habitats (at high tide), and all of the subtidal habitats. Because of their mobility and widely varying sensitivities to environmental factors, fish assemblages are highly variable in time and space throughout Long Island Sound.

Demersal (bottom dwelling) and pelagic (water column dwelling) marine fish and shallow water estuarine fish species are collected as part of the DEP Long Island Sound trawl surveys. Over 114 species of marine fish have been collected in the 17 years of Sound-wide surveys.³⁸ In general, total fish catch (catch per unit effort, or CPUE) has been lowest in eastern Long Island Sound, especially over sandy substrate (Appendix C, Figure C-28). The finfish species assemblage has been observed to vary between a cold-water demersal assemblage and warm water migrants.³⁹ The cold-water assemblage was dominated by windowpane and winter flounder and little skate. Occasionally, the pelagic oceanic Atlantic herring was captured in large numbers. Warming waters caused these cold-water species to move to deeper waters, with warm water migrants such as bluefish, butterfish, weakfish and scup moving into Long Island Sound. The highest number of fish species occurred in a shallow area of the central basin off the Housatonic River, which is characterized by variable sediments. The fish assemblage was also diverse in an area in the central basin with deep water and mud substrate. The fewest fish species captured were in shallow sandy areas along the eastern Connecticut shoreline, where large volumes of fresh water from the Connecticut River limit the number of species that occur. Eastern Long Island Sound also contains a deep, sandy area that is oceanic in character with low numbers of fish species taken in the DEP survey.

³⁶ DEP. 2002. A study of marine recreational fisheries in Connecticut.

³⁷ DEP. 2002. A study of marine recreational fisheries in Connecticut.

³⁸ DEP. A study of marine recreational fisheries in Connecticut.

³⁹ Gottschall, K.F., M.W. Johnson, and D.G. Simpson. 2000. The Distribution and Size Composition of Finfish, American Lobster, and Long-finned Squid in Long Island Sound based on the Connecticut Fisheries Division Bottom Trawl Survey. 1984-1994. NOAA Tech. Rep. NMFS 148. 195 pp.

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Commercial and recreational fisheries in Long Island Sound are valued at over one billion dollars.⁴⁰ In 2001, over 325,000 Connecticut anglers made over 1.7 million fishing trips, catching nearly 6.5 million fish. Four species, bluefish, striped bass, scup, and summer flounder, composed over 90% of the catch. Tautog and winter flounder were once important recreational species, but catches have been low in recent years.⁴¹ Management efforts are causing only modest increases. Bluefish and striped bass are highly mobile, migratory species whose habitat requirements are unrelated to specific environmental conditions in Long Island Sound. However, to the extent that specific environmental conditions affect the abundance of their prey or forage fish, they could be affected.

Shallow estuarine areas along the shoreline are important as areas for forage fish (i.e., short-lived, inshore species that are food for larger fish) and nursery areas for commercial species such as winter flounder. DEP estuarine fish surveys found forage fish catches varied widely among years. For various reasons, young-of-the-year (YOY) winter flounder have shown general declines since 1988, with minor rebounds in 1992, 1994 and 1996.⁴² Estuarine winter flounder catches have been correlated with Age 2 fish catches in Long Island Sound, indicating these nursery areas are supporting the adult population.

Fish species show varying sensitivity to impaired water quality. Dissolved oxygen is essential to finfish and shellfish survival. Simpson *et al.* developed an index of habitat impairment, which was based on the level of dissolved oxygen, the oxygen tolerances of 16 species of fish and shellfish and resulting reduction in biomass.⁴³ This index provides a simplified means of determining the areas of Long Island Sound that are most highly stressed by low oxygen events.

In 1976, the Magnuson-Stevens Fishery Conservation and Management Act (the Magnuson Act) established a management system for marine fisheries (shellfish and finfish) resources of the United States. This included the establishment of regional management councils that develop fishery management plans for conservation and management of fishery resources. The 1986 and 1996 amendments to the Magnuson Act, renamed the Sustainable Fisheries Act, included evaluation of habitat loss and protection of critical habitat. Specifically, Congress charged the National Marine Fisheries Service (NMFS) and the fishery management councils, along with other federal and state agencies and the fishing community, to identify habitats essential to managed species, which include marine, estuarine, and anadromous finfish, mollusks and crustaceans. The habitat is identified as "essential fish habitat" (EFH) and is defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (Magnuson-Stevens Act, 16 USC. Section 1801, *et seq.*).

⁴⁰ *Ibid.*

⁴¹ Gottschall *et al.*

⁴² *Ibid.*

⁴³ Simpson, D.G., K. Gottschall, and M. Johnson. 1995. Cooperative agency resource assessment (Job 5), in: A Study of Marine Recreational Fisheries in Connecticut, DEP Marine Fisheries Office, Box 719, Old Lyme, Connecticut 06371, pp. 87-135.

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The Connecticut portion of Long Island Sound encompasses 13 EFH quadrants, each defined as 10 minute by 10 minute squares of latitude and longitude, that are designated as important habitat for 27 fish species, 1 mollusk, and 1 crustacean (American lobster). The EFH designations are based on research of habitat requirements for the individual life stages (generally eggs, larvae, juveniles, adults, and spawning adults). This information allows a specific determination providing sufficient data to determine the importance of specific areas in Long Island Sound to these species.⁴⁴ The assumption is that all areas within EFH are important for the listed species unless proven otherwise.

Turtles

Five marine turtle species could utilize Long Island Sound: the Atlantic Green Turtle, Atlantic Ridley Turtle, the Hawksbill Sea Turtle, the Leatherback Turtle, and the Loggerhead Turtle (Appendix C, Figure C-8). All are listed by the U.S. Fish and Wildlife Service (USFWS) as threatened or endangered. With the exception of the Hawksbill, all are also listed by Connecticut as threatened or endangered. These species have all been occasionally observed in Long Island Sound in the summer months. Their use of Long Island Sound is restricted to summer feeding activities. Nesting and breeding occur in the tropics.

Birds

Bird species that utilize Long Island Sound can be divided into several types based on life history. Colonial birds, such as the roseate tern and great egret, use offshore islands for nesting (Appendix C, Figure C-16). Several of these are listed as threatened or endangered by the state or federal government, and are described more fully below. Shorebirds, such as willets, sandpipers, and plovers, are species that rely upon beaches and tidal flats for breeding and feeding. Wading birds, such as egrets and herons, are those that feed in inundated areas (marshes) such as egrets and herons. Recreationally important waterfowl, such as ducks and geese, use bays and open water. Many sea ducks overwinter in Long Island Sound. Others, such as the American Black Duck, reside near coastal marshes in winter. Because of their dependence on specific habitat types (offshore islands, coastal wetlands, open protected waters) during their life cycle, impacts are related to time of year and habitat type.

Marine Mammals

Marine mammals are protected by the Marine Mammals Protection Act of 1972 (MMPA 16 USC Section 1361, *et seq.*), which ensures that these species are maintained or restored to healthy population levels. According to the MMPA, no marine mammals are allowed to be “taken”, defined as “harass, hunt, capture, or kill.” Eleven species, including four in the dolphin family, four seals, and three whales, occasionally occur in Long Island Sound (Appendix C, Figure C-9). Islands and exposed areas at low tide provide seal haul-out sites, especially during the winter months. Results of a 1999 census

⁴⁴ ENSR. 2001. Essential fish habitat summaries for important Long Island Sound species.

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indicated a population of more than 6,000 seals within Long Island Sound waters (which includes both Connecticut and New York), the highest number in two decades. Over 2,000 seals were observed on Great Gull Island, near Plum Island, New York. Harbor porpoises have been occasionally observed in Long Island Sound. Humpback whales have been occasionally noted in the eastern Long Island Sound. Other whales species are rarely observed.

Table 3 – List of Marine Mammals That Can Occur In Long Island Sound

Species: (Common Name)	(Scientific Name)
Atlantic white sided dolphin	<i>Lagenorhynchus acutus</i>
Saddle backed dolphin	<i>Dolphinus delphis</i>
Harbor Porpoise	<i>Phocoena phocoena</i>
Harp seal	<i>Pagophilus groenlandicus</i>
Harbor seal ⁴⁵	<i>Phoca vitulina</i>
Gray seal	<i>Halichoerus grypus</i>
Hooded seal	<i>Cystophora cirrata</i>
Fin whale	<i>Balaenoptera physalus</i>
Humpback whale	<i>Megaptera novaeanglicae</i>
Minke whale	<i>Balaenoptera physalus</i>

Commercially and Recreationally Important Species

In addition to finfish discussed above, commercially and recreationally important species include shellfish and lobster.

Shellfish Commercially harvested shellfish species include hard clam (*Mercenaria mercenaria*) and the eastern oyster (*Crassostrea virginica* (Appendix C, Figure C-10)). The oyster is an economically, as well as ecologically, important shellfish in Connecticut. Oyster harvests peaked in the early 1990s but have since declined dramatically, primarily as a result of disease. Oyster harvest decreased from 525,809 bushels in 1996 (worth \$29 million) to approximately 35,000 bushels in 2002 (worth \$2.0 million).⁴⁶ Oysters are distributed from intertidal to shallow subtidal depths, where water salinity ranges between 5 and 30 parts per thousand (ppt). They can grow on both mud and rocky substrate; however, hard substrate, such as oyster shells or cultch, is preferred.⁴⁷ Commercial oyster areas include seed beds, grow-out areas, and fattening grounds. Seed areas are bottom areas spread with cultch, which provides a hard substrate for larvae to attach and grow. Clean cultch is essential to growth and survival of juvenile oysters. Oysters in seed areas are transplanted to growing areas, characterized by adequate food

⁴⁵ Species of Special Concern in New York.

⁴⁶ <http://www.state.ct.us/doag/business/aquac/oysthrar.htm>.

⁴⁷ Sellers, M.A. and J.G. Stanley. 1984. Species profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates: American Oyster. FWS/OBS-82/11.23 TR EL-82-4.

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supply and good circulation. Oysters remain in these areas for one to three years before they are moved to “fattening” grounds, shallow, well-protected areas.

Hard clams or quahogs, (*Mercenaria mercenaria*), occur in intertidal and subtidal areas of estuaries, with salinities from 10 to 35 ppt. They occur mainly on clean sand substrates with good water circulation.⁴⁸ Harvesting relies on power dredges and rakes. The hard clam industry has been steadily increasing from the mid-1990s to over 286,000 bushels with a value of almost \$9.2 million in 2002.⁴⁹

Lobsters The American lobster, (*Homarus americanus*) is one of the most valuable commercial fishery species in Long Island Sound. Annual landings prior to 1999 ranged from 2.5 million pounds in 1995 to 3.7 million pounds in 1998, worth approximately \$10 dollars.⁵⁰ Approximately 25-30% of the landings were made in western Long Island Sound, largely west of Stratford (Appendix C, Figure C-13; Figure C-14). Preliminary indications are that sediment type and the sedimentary environment are the primary factors for explaining the abundance and distribution of lobster with temperature, water depth, and dissolved oxygen concentrations of secondary importance.⁵¹ Lobster catches have been reduced by 90% due to lobster “die-off” events (unusually high incidence of natural mortality) in 1998 and 2002. The cause of the decline in lobster catches is unknown at this time, but research is being undertaken to determine the reason including an evaluation of factors such as disease, in combination with abnormally high water temperatures, and pesticides. Connecticut licensed 441 lobsterman in 1998 and 344 in 2002, a decline of 22%.⁵² Moreover, many license holders have not actively fished in recent years due to the die-off. During this period, the number of active Connecticut lobstermen is estimated to have decreased from 350 to 70.⁵³ This highly exploited species is considered overfished by NMFS.

Threatened and Endangered Species

Federal and state-listed species associated with Connecticut’s coastal and marine environment are summarized below. Connecticut, through its Natural Heritage Program, is the central repository for information on the biology, population status and threats to the elements of natural diversity in Connecticut. The Natural Diversity Data Base (NDDb) contains information on the status of more than 1,000 species of plant and

⁴⁸ Stanley, J.G. and R. DeWitt. 1983. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (North Atlantic). U.S. Fish. Wildlife Service, FWS/OBS-82/11.

⁴⁹ Connecticut Department of Agriculture, Bureau of Aquaculture - personal communication from David Carey, Director, on May 27, 2003 www.state.ct.us/doag/business/aquac/oysthar.htm.

⁵⁰ Connecticut Department of Environmental Protection. 2002. A study of marine recreational fisheries in Connecticut.

⁵¹ Howell, P., C. Giannini, K. Gottschall, D. Pacileo, J. Holly, J. Burton, and J. Benway. 2002. Semi-annual Performance Report, Assessment and Monitoring of the American Lobster Resource and Fishery in Long Island Sound.

⁵² Personal communication with DEP Marine Fisheries (DEP Licensing Statistics).

⁵³ Nick Crismale, Connecticut Lobstermen’s Association, personal communication. May 5, 2003.

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animals, including invertebrates, and 45 significant natural communities, which includes the Endangered, Threatened or Special Concern species listed in Connecticut.

Federally Listed Species The Endangered Species Act of 1973 (ESA, 16 USC Sections 1531-1543) protects federally listed endangered species. Section 7 of the ESA requires that every federal action be reviewed in order to ensure that actions do not jeopardize the continued existence of a federally listed endangered or threatened species or result in the destruction or adverse modification of the designated critical habitat.⁵⁴

Eight federally listed species could occur in Long Island Sound (Table 4). Five species of marine turtles that are listed as either threatened or endangered occasionally occur in Long Island Sound (Appendix C, Figure C-8). Their occasional occurrence in Long Island Sound is solely for feeding purposes during the warmer months (June-November). Breeding and nesting activities do not occur in northeast waters. No areas are designated as critical habitats in Long Island Sound.

One federally listed fish species, the shortnose sturgeon, can occur in Long Island Sound (Appendix C, Figure C-16). This anadromous species is generally restricted to freshwater and brackish waters of the Connecticut River, but could make an occasional foray into Long Island Sound.

Two federally listed bird species, the roseate tern and piping plover, occur in Long Island Sound. The roseate tern uses offshore islands for breeding. Piping plover nest on beaches.

State-Listed Endangered Species Fourteen Connecticut state-listed species could occur in Long Island Sound, plus two from the New York list (Table 4). State-listed marine mammal species include the harbor seal (in New York and Connecticut) and harbor porpoise, in New York only. These species are discussed under the marine mammals section. Five species of turtle, described above, could occur in Long Island Sound. DEP has reported to the Task Force that the majority of research and data regarding threatened and endangered species has been directed to terrestrial species. Consequently, the list of marine species may be incomplete, due to the lack of comprehensive research to identify threatened and endangered species in Long Island Sound, and potentially misleading in that the lists do not identify habitat, and associated habitat of the near coastal environment, which is an important ecological component to support the species of Long Island Sound.

⁵⁴ Critical habitat is defined as "(i) specific areas within the geographic area occupied by the species...on which are found those physical or biological features (I) essential to the conservation of the species, (II) which may require special management considerations or protection, and (ii) specific areas outside the geographical areas outside the geographical area occupied by the species that are...essential for the conservation of the species."

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Table 4 – Federal and State-listed Threatened and Endangered Marine Species Potentially Occurring in Long Island Sound

Species	Scientific Name	Federal Status	State Status	Potential Use of Long Island Sound ⁵⁵
Atlantic green turtle	<i>Chelonia mydas</i>	T	T	Feeding in submerged aquatic vegetation, macroalgae in summer
Atlantic Ridley turtle	<i>Lepidochelys kempseyi</i>	E	E	Juvenile and adults found in Connecticut in summer, foraging for crabs.
Hawksbill sea turtle	<i>Eremochelys imbricata</i>	E		Very rare, occasional summer foraging
Leatherback turtle	<i>Dermochelys coriacea</i>	E	E	Observed off Stonington and in Block Island Sound and juvenile. Adult forage on jellyfish and comb jellies
Loggerhead turtle	<i>Caretta caretta</i>	T	T	Rarely seen in Connecticut. Reported on north shore of Long Island. Summer feeding on crabs in coastal bays.
Piping plover	<i>Charadrius melodus</i>	T	T	Uses sandy beaches for breeding, nesting.
Least tern	<i>Sterna antillarum</i>		T	Uses sandy beaches for breeding, nesting.
Roseate tern	<i>Sterna dougallii dougallii</i>	E	E	Colonial nesting on beaches or rocky offshore islands, including Falkner, Madison, and Duck.
Snowy egret	<i>Egretta thula</i>		T	Uses coastal wetlands and marshes for feeding and nesting.
Great egret	<i>Ardea albus</i>		T	Nests on uninhabited offshore islands; feeds in coastal marshes.
Least bittern	<i>Ixobrychus exilis</i>		T	Uses coastal brackish marshes for feeding.

⁵⁵ Turtle information from USFWS 1997. Significant habitats and habitat complexes of the New York Bight Watershed. USFWS, Coastal Estuaries Program. Charlestown, RI. Shortnose sturgeon information from NMFS 1998. Final recovery plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon recovery team for the National Marine Fisheries Service.

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Species	Scientific Name	Federal Status	State Status	Potential Use of Long Island Sound ⁵⁵
Black rail	<i>Laterallus jamaicensis</i>		E	Nests at edge of high coastal marshes.
Willet	<i>Catoptrophorus semipalmatus</i>		SC	Uses coastal islands and marshes for nesting and feeding.
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	E	E	Resident of freshwater portions of the Connecticut River, with possible forays into nearshore marine habitats.
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>		T	Uses Long Island Sound for feeding or resting in transit to spawning in Hudson River.
Harbor seal	<i>Phoca vitulina</i>		NY-SC CT Listed	Increasing use of Long Island Sound waters; islands and exposed areas provide important haul-out sites, especially in winter.
Harbor porpoise	<i>Phocoena phocoena</i>		NY-SC	Occasional use of Long Island Sound waters.

T = Threatened

E = Endangered

SC = Special Concern

Eight state-listed bird species occur in coastal Long Island Sound. Two species, roseate tern (also federally listed) and great egret, use offshore, uninhabited islands for breeding. Three species rely on beach habitats for nesting: piping plover (also a federally listed species), least tern, and the roseate tern. The remaining species utilize coastal marshes (in part or exclusively) as feeding and nesting habitat. These include the willet, least bittern, snowy egret and black rail. One fish, the Atlantic sturgeon, is listed as threatened by the state. Long Island Sound may be an important feeding and resting area on the way to or from spawning activities in the Hudson River.

There are no threatened/endangered marine plant species in Long Island Sound. However, the Natural Heritage Program lists a number of threatened/endangered plants that occur along the coast (Appendix C, Figure C-15).

2.1.5 Socio-economic and Cultural Resources

Long Island Sound plays a critical role in the economies of both Connecticut and New York. Bordered by 78 coastal cities, towns, and villages in Connecticut and New York,

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Long Island Sound is located in the midst of the most densely populated region of the United States (Appendix C, Figure C-24; Figure C-25). More than 8 million people live within Long Island Sound's watershed, and more than 21 million people reside within a 50-mile radius of Long Island Sound. Each year, millions visit the Long Island Sound area for recreational purposes.

Historically, Long Island Sound was important to the cultural and economic growth of both Connecticut and New York, with many initial settlements located along the coast and oriented around the maritime industry and waterborne transportation. Today, Long Island Sound remains a significant component of the regional economy, generating approximately \$5.5 billion annually as a result of activities such as boating, tourism, commercial and sport fishing, swimming, and beach going. Long Island Sound's natural resources and aesthetic attributes also enhance shoreline property values, and provide an impetus for tourism. Further, the regional economy benefits from other valuable uses of Long Island Sound, including cargo shipping, ferry transportation, and power generation.⁵⁶

In Connecticut, Long Island Sound's key socioeconomic and cultural attributes include:

Commercial and Recreational Fishing

Commercial and recreational fishing, including shellfish and commercial aquaculture, are important components of Connecticut's economy and are particularly significant to some coastal municipalities. One estimate of the annual economic benefit to regional economy of these fisheries (including oysters, scallops, blue crabs, flounder, striped bass, and bluefish) is more than \$1.2 billion.⁵⁷

Connecticut's fisheries include both recreational fishing in Long Island Sound and commercial fishing in the Atlantic Ocean. According to 2000 data, there were approximately 500 commercial fishermen licensed in Connecticut. In 1996, the dockside value of commercial seafood landings in Connecticut was reported as \$48 million. Marine recreational angling also is important; although current data are not available, in 1991, saltwater recreational fishing in Connecticut reportedly supported almost 4,000 jobs and accounted for more than \$100 million in income.^{58,59}

Long Island Sound's naturally occurring, as well as cultivated (aquacultured), resources also are important to the regional economy.⁶⁰ Approximately 56,000

⁵⁶ EPA, LISS, Introduction to Management Plan, <http://www.epa.gov/region01/eco/lis/intro.html>.

⁵⁷ Save the Sound http://www.savethesound.org/mb_habitat.htm.

⁵⁸ Stedman, Susan-Marie and Jeanne Hanson, 1996, Habitat Connections: Wetlands, Fisheries & Economics in the New England Coastal States.

⁵⁹ Connecticut Office of Policy & Management, October 31, 2001, Food Production. <http://www.opm.state.ct.us/pd3/physical/c&dplan-rec/Food.htm>.

⁶⁰ Economic Benefit of Connecticut's Oyster Farming Industry. Connecticut Department of Agriculture <http://www.state.ct.us/doag/business/aquac/oysescono.htm>.

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acres are presently under active cultivation for shellfish production (oysters and clams), and an additional 392,000 acres of Connecticut waters are identified as potential shellfish areas in Long Island Sound.⁶¹

The Department of Agriculture, Bureau of Aquaculture estimates that the shellfish industry accounts for about 600 jobs and the annual harvest of oysters exceeded 35,000 bushels in 2002, with an approximate wholesale value of \$2 million. The hard clam harvest totaled 286,000 bushels in 2002, with an approximate wholesale value of \$9.2 million. Connecticut oyster farmers produce high value oysters.⁶²

The economic importance of Connecticut's lobster industry has declined significantly since 1998 due to the lobster die-off believed to be caused, at least in part, by a parasitic protozoan known as *Paramoeba*. DEP subsequently determined that approximately 70% of the lobster fishers surveyed in western Long Island Sound lost 100% of their total income and the remainder lost 30% to 90% of total income. Fish trawl data from western Long Island Sound indicated a significant reduction in the lobster population Sound-wide, which could result in a failure of the commercial lobster fishery.⁶³ On January 26, 2000, based in part on evidence collected by DEP, US Department of Commerce Secretary William M. Daley declared a commercial lobster fishery failure in Long Island Sound. The economic losses to the lobster industry prompted Governor Rowland to seek Federal Disaster relief.

Waterborne Commerce

In 2000, Connecticut's three deepwater ports (Bridgeport, New Haven, and New London) handled about 17 million tons of primary bulk commodities; this would equate to the addition of approximately 2,300 trucks each weekday on Connecticut highways (mainly Interstate 95) if waterborne access was not available. Primary freight at each port included:

The Port of New Haven handled almost two-thirds of the total waterborne freight in Connecticut (10.6 tons per day on average), with petroleum products accounting for about 80% of this volume. Other products include steel, sand and gravel, copper, cement, and non-metallic minerals.

The Port of Bridgeport handled 4.3 million tons per day on average, of which two-thirds was petroleum products. Bridgeport also is the primary site for tropical fruit imports, primarily bananas.

⁶¹ LISS Fact Sheet #12.

⁶² Department of Agriculture, Bureau of Aquaculture – personal communication with David Carey, Director, on May 22, 2003.

⁶³ Governor Rowland Requests \$20 Million In Disaster Relief For Lobster Fishers - DEP Submits Lobster Report to Secretary Daley <http://dep.state.ct.us/whatshap/press/2000/mf0210.htm>.

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The Port of New London handled about 2 million tons, including lumber, steel, petroleum, and coal lignite.^{64,65}

The operation of the three deepwater ports directly and indirectly accounts for approximately 3% of the state's total employment and 2.6% of the state's total output, and constitutes about 2.5% of total state and municipal tax revenues.

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The Connecticut Port Authority (established in 1993) was created to promote the economic development of the state's three deepwater ports through, among other objectives, planning, coordinating and marketing in support of the entities operating the ports together with establishment of foreign-trade zones. The Authority's responsibilities have been expanded to include all ports, harbors, and navigable tidal rivers.

The Connecticut Maritime Coalition (Coalition), a non-profit association of businesses and organizations gathers statistics on the role and importance of the Connecticut's maritime infrastructure.⁶⁶ According to the Coalition, in 1997, the maritime industry accounted for 349 businesses, 12,225 jobs, with aggregate sales of \$2.61 billion.

A 2000 survey of ferry operators determined that there were over 2.1 million passenger boardings and nearly 852,000 vehicle boardings for the four major ferries servicing Connecticut's ports.

Energy

Long Island Sound serves as a major thoroughfare for fuel oil delivery for home heating oil, jet fuel, and for oil-fired electric generation.

Energy related materials, including bulk commodities, are delivered to Connecticut from the Port of New York - New Jersey by barges transiting Long Island Sound and are then unloaded, sometimes as far upriver as Hartford.

Long Island Sound provides cooling water for major electric power plants at Waterford, New Haven, Bridgeport, and Norwalk.

⁶⁴ U.S. Army Corps of Engineers, 2000, Waterborne Commerce of the United States.

⁶⁵ Connecticut Center of Economic Analysis, November 10, 2002, Draft Background Paper on Water: Freight Overview.

⁶⁶ Connecticut Maritime Coalition <http://www.ctmaritime.com/transportation.html>.

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Cables and pipelines across the bottom of Long Island Sound transport energy between Long Island and Connecticut.

Tourism and Recreation

Of the approximately \$5.5 billion generated annually from sound-related activities, a large portion of the revenue is derived from boating, fishing, beachgoing, and swimming.

The number of sunbathers, swimmers, and boaters using Long Island Sound on a summer weekend day is often greater than the combined populations of Delaware and Alaska.⁶⁷

Other primary recreation/tourism activities include camping, touring historic sites, and visiting coastal attractions, such as Mystic Seaport, Mystic Aquarium & Institute for Exploration, and the Maritime Aquarium at Norwalk.⁶⁸

Parks and Conservation Areas

State and local parks, state forests and conservation areas, as well as areas within the federally-designated Stewart B. McKinney National Wildlife Refuge, are scattered throughout Connecticut coastal communities (See Appendix C, Figure C-17). These areas add to the attraction of Connecticut coast for visitor and resident recreation. A number of these also provide direct access to coastal waters and are identified on Connecticut's Coastal Access Guide.

Protection of coastal wetlands is a significant aspect of ongoing efforts to acquire coastal land for preservation. Today there are at least 26 different land trusts along the Connecticut coast and major river systems, which aid in wetland protection. DEP presently owns nearly 30% (1,956 hectares or 4,833 acres) of all tidal wetlands in the state, which reflects a long history of land acquisition for parks, forests and wildlife purposes. In 1992, the DEP initiated a tidal wetland restoration program.

In Connecticut, the 160-mile Long Island Sound coastline represents a significant recreational resource. The Connecticut Coastal Access Guide provides detailed information on and identifies over 250 sites, such as beaches, campgrounds, parks, and boat launches, which the public can use to access Long Island Sound.⁶⁹

⁶⁷ Estuaries on the Edge: The Vital Link Between Land and Sea, Chapter Six, Long Island Sound in Connecticut and New York, p. 143.

⁶⁸ www.tourism.state.ct.us/.

⁶⁹ Connecticut Coastal Access Guide, July 2001.

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According to DEP,⁷⁰ there are currently 58,000 trailerable boats registered in the state and 5,300 state and municipal parking spaces. At a ratio of 11 boats per space, current demand greatly exceeds availability. DEP anticipates that the approximate 50% increase in fishing access should be accommodated primarily through leases and permanent easements. The largest need for additional boating access to Long Island Sound exists in southwestern Connecticut.

Historic and Cultural Resources

Long Island Sound and the surrounding coastal areas have a rich cultural heritage. According to the Connecticut Historical Commission (CHC) and the Office of the State Archaeologist, the historic record indicates that there are thousands of potential underwater archaeological sites, including shipwrecks, in Long Island Sound. However, given the size of Long Island Sound, only limited submarine archeological investigations have been conducted. Certain of the studies that have been performed were associated with permit applications for proposed developments in Long Island Sound. The results of such archaeological studies are maintained at the CHC and the Office of the State Archaeologist.

2.2 REGULATORY FRAMEWORK FOR PROJECTS IN LONG ISLAND SOUND

2.2.1 Reliability Overview

Over the last two decades, airlines, trucks, banks and telecommunications have been deregulated. The natural gas and electricity industries were the most recent American monopolies to transition to competitive market forces. Deregulation of Connecticut's natural gas and electricity industries has been well underway since the late 1980s when a series of orders issued by the Federal Energy Regulatory Commission (FERC) effectively deregulated interstate pipeline transportation across the U.S. By 1992, the FERC completed the transition to competition under Order No. 636, which required pipeline transportation and storage services to be available to all shippers on an unbundled, non-discriminatory basis. At the local level, natural gas transportation and distribution services continue to be regulated by state regulatory commissions throughout New England.

The FERC has jurisdiction over both the construction of interstate natural gas transmission projects and the transportation of natural gas in interstate commerce. The FERC has established criteria for determining need and assessing whether a natural gas project would serve the public interest. The FERC also regulates the transmission and

⁷⁰ The State Environmental Goals and Indicators Project (SEGIP) - State of Connecticut, Goals and Benchmarks, For the Year 2000 and Beyond. <http://www.pepps.fsu.edu/segip/states/CT/stewend.html>.

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wholesale sales of electricity in interstate commerce, and tariffs associated with merchant transmission facilities.⁷¹

The North American Reliability Council (NERC), a New Jersey-based not-for-profit organization, was formed in 1968 in response to the 1965 power outage in the Northeast. NERC's mission "is to ensure that the bulk electric system in North America is reliable, adequate and secure."⁷² NERC has conducted reliability assessments of the bulk electric systems of North America since 1970. NERC supports reliability standards that are mandatory, enforceable and fairly applied. NERC's *2003 Summer Assessment* concluded that, based upon data submitted as of April 30, 2003 and because of a slow North American economy, energy demand is expected to rise by only about 1 percent this summer. It did, however, identify SWCT, New York City and Long Island as "areas of concern." NERC concluded in its *2003 Summer Assessment* that "[l]ocally tight resources compounded by transmission limitations into and within those areas make them particularly susceptible to reliability problems."

Congress passed the Energy Policy Act of 1992 to stimulate a workable competitive market for wholesale electricity. New England's bulk generation and transmission facilities had been operated by NEPOOL, a voluntary association of investor-owned and municipal utilities throughout New England, since 1971. NEPOOL had achieved significant cost savings and reliability improvements for its members.

In 1996, the FERC issued Order 888 to remove impediments to competition in the bulk power marketplace in order to lower costs for consumers. Also in 1996, the FERC issued Order 889. Each public utility (or its agent) that owns, controls, or operates facilities used for the transmission of electricity (generally above 69 kV) was required to create or participate in an Open Access Same-time Information System (OASIS) that describes available transmission capacity, prices, and other information that will enable transmission customers to obtain open non-discriminatory transmission service. In response, NEPOOL proposed that an independent system operator (ISO) be created to administer the deregulated wholesale power markets for NEPOOL membership. In July 1997, ISO-New England (ISO-NE) was created in large part through the transfer of staff and equipment from NEPOOL. ISO-NE has been given responsibility by the FERC for planning and operating New England's (including Connecticut's) electric transmission and generation system. A separate entity – NYISO – is responsible for the New York control area. Historically and presently, these ISOs coordinate operations and planning to ensure system reliability and market efficiency.

Toward assuring reliability in New England, ISO-NE plans and operates the New England bulk power system to criteria that address both adequacy of generating resources to meet projected demand and compliance with the transmission planning/operating criteria set forth in NEPOOL's planning procedures, which are based on NERC and the Northeast Power Coordinating Council criteria. Before a system can be considered "reliable", it must satisfy both generation and transmission criteria. ISO-NE's Regional

⁷¹ Federal Energy Regulatory Commission. www.ferc.gov.

⁷² NERC, *2003 Summer Assessment*, May 2003.

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Transmission Expansion Plan (RTEP) is based on the reliability criterion that the bulk power system should not fail to meet load more than once every ten years. The “one failure in ten year standard” (otherwise referred to as Loss Of Load Expectation (LOLE)) is a NERC-mandated criterion and assumes an unconstrained transmission system within the region. Central to this reliability criterion is consideration of contingency events where critical resources are assumed to fail or be unavailable. ISO-NE plans for such events by having a robust system capable of withstanding severe and sudden changes with sufficient generation and transmission redundancy. The New England bulk power system must remain stable during and following the most severe contingencies.⁷³

A failure to meet the bulk power reliability criteria would suggest a major system reliability issue. At the same time, however, satisfying this LOLE criterion alone does not guarantee a reliable system. Some regional sub-areas of the bulk power system may still be susceptible to transmission problems even where reliability bulk support criteria have been met. To assure reliability, the ISO-NE plans sufficient transmission and generation capability to serve load in the event of a generation and/or transmission contingency event. Most transmission lines are not loaded to their continuous capacity ratings. The transmission system must be designed to maintain current and voltage levels within the operating limits of each of the system components during normal operation as well as following a contingency event. For further discussion, please see Section 2.3 of the Assessment Report Part I.

2.2.2 Regulatory Overview

Connecticut and New York share a marine border approximately 95 miles long that runs longitudinally through the middle of Long Island Sound. Long Island Sound is considered an “historic bay,”⁷⁴ and consists almost entirely of Connecticut and New York submerged lands from shore to shore. Unlike most other coastal states in the U.S., there is no offshore federal jurisdictional zone beyond three miles of the shoreline. Nonetheless, the federal laws pertaining to security, commerce, environmental protection, and navigation apply to the waters of Long Island Sound. Thus, interstate energy and telecommunications infrastructure projects across Long Island Sound are subject to Connecticut, New York, and federal regulatory programs, and project developers must pursue permits and certificates from each state and federal agency with jurisdiction over the project.

Similarly, energy planning (including reliability assessments and need determinations) in Connecticut and in New York is performed by both federal and state entities. Although ISO-NE and NYISO coordinate operations and planning within their control areas, as well as at their interfaces, the siting and permitting of transmission and generation

⁷³ Reliability Standards for the NEPOOL, July 9, 1999.

⁷⁴ Historic Bay is defined as a “water area over which a coastal state has asserted sovereignty over a long period of time, with the acquiescence of foreign nations.” Reed, Michael W., *Shore and Sea Boundaries*, NOAA Office of Coast Survey (2000).

See <http://chartmaker.nco.noaa.gov/hsd/shallow.htm>.

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facilities is not under the jurisdiction of the respective system operators. Each state siting commission applies its own need/benefit test to a proposed project.

The following provides an overview of the regulatory programs applicable to proposed projects in Long Island Sound, and then describes the specific federal and state agencies with regulatory authority over permit and certificate approvals for such projects.

A variety of established federal and state regulatory programs presently afford protection to Long Island Sound's natural resources. These include: the National Environmental Policy Act of 1969 (NEPA), the Marine Mammals Protection Act of 1972 (MMPA), the Coastal Zone Management Act of 1972 (CZMA), Marine Protection Research and Sanctuaries Act (1972), the Endangered Species Act of 1973 (ESA), the Clean Water Act of 1972 (CWA), Connecticut's Public Utility Environmental Standards Act of 1971 (PUESA), Connecticut's Tidal Wetland Act, Inland Wetlands and Watercourses Act (IWWA), and Coastal Management Act (CMA), the FERC environmental review process and certificate conditions, Section 404 Army Corps of Engineers (ACOE) regulations, the National Historic Preservation Act (NHPA) (Section 106 Review), the New York Public Service Law, and the New York Environmental Quality Review Act.

Although these environmental laws provide the basis for protection of Long Island Sound's resources, the regulatory processes applicable to cross-Sound projects vary, depending on the type of infrastructure development and the federal or state agencies with primary jurisdiction. However, the key elements of the current federal and state regulatory framework applicable to cross-Sound projects are as follows:

For any cross-Sound project, the ACOE, which administers permits pertaining to work in waters of the U.S., serves as an overarching regulatory authority. An individual ACOE permit is required for any cross-Sound project. Other federal agencies (e.g., NMFS, USFWS, EPA) act as cooperating agencies, providing input to the ACOE permitting process. In addition, the ACOE coordinates directly with involved state agencies, such as DEP, NYSDEC, the New York Department of State (NYSDOS), and also the State Historic Preservation Officers (SHPO). Prior to issuance of an ACOE permit, federal authorizations or permits that are delegated to the states (e.g., coastal consistency certification, CWA Section 401 water quality certification) must be obtained.

For interstate electric transmission cable crossings of Long Island Sound, separate certificates are required from both the Siting Council and the New York Public Service Commission (NYSPSC). Such approvals, which are in addition to authorizations and certificates from the ACOE, DEP, and NYSDOS, involve determinations of both project need/benefit and environmental compatibility.

For interstate natural gas pipeline crossings of Long Island Sound, the FERC has primary jurisdiction for determining the public need for a project and for conducting federal environmental impact analyses. As part of its environmental review, the FERC requires project applicants to submit detailed environmental

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resource information and then prepares draft and final environmental impact statements (EISs). The FERC's regulatory review involves a defined public participation process, as well as coordination with other federal (e.g., ACOE, EPA, NMFS, USFWS), state (e.g., DEP, NYSDEC, SHPOs), and local regulatory agencies. Like the ACOE permit process, the FERC environmental approvals for a project are typically contingent upon the receipt of appropriate state regulatory approvals (e.g., coastal consistency certification, CWA Section 401 water quality certification). The Siting Council has a limited role with respect to interstate natural gas pipeline projects. In New York, natural gas projects are required to obtain permits and approvals from NYSDEC and NYSDOS; the NYSPSC process does not apply.

For telecommunications infrastructure projects across Long Island Sound, the ACOE permit is the primary regulatory mechanism. Telecommunications cables are not subject to Siting Council jurisdiction.

Each permit and/or certificate for an energy or telecommunications infrastructure crossing of Long Island Sound typically includes numerous conditions that specify the mechanisms to be implemented to assure that adverse environmental impacts are avoided or minimized. Often, the resource agencies coordinate with respect to the development of such conditions. Permit/certificate conditions are tailored to the characteristics of both the project and the potentially affected resources; thus, mitigation conditions for construction through a coastal Connecticut area that may contain shellfish resources will differ substantially from conditions for construction of the same project through a coastal area on Long Island that is developed for industrial purposes and does not contain natural resources such as tidal wetlands, shellfish lease areas, or threatened and endangered species. Therefore, it is not surprising that the standards applicable to a cross-Sound infrastructure project may differ between New York and Connecticut.

2.2.3 Federal Jurisdiction

The Federal Energy Regulatory Commission

Under the federal Natural Gas Act (NGA) of 1938, the FERC regulates both the construction of natural gas pipeline facilities and the transportation of natural gas in interstate commerce. Companies providing services and constructing and operating pipelines must first obtain from the FERC a Certificate of Public Convenience and Necessity. In accordance with 15 U.S.C. Sec. 717f(e):

“a certificate shall be issued to any qualified applicant therefore, authorizing the whole or any part of the operation, sale, service, construction, extension, or acquisition covered by the application, if it is found that the applicant is able and willing properly to do the acts and to perform the service proposed and to conform to the provisions of this chapter and the requirements, rules, and regulations of the Commission thereunder, and that the proposed service, sale, operation, construction,

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extension, or acquisition, to the extent authorized by the certificate, is or will be required by the present or future public convenience and necessity; otherwise such application shall be denied.”

On September 15, 1999, the FERC issued a Policy Statement⁷⁵ providing guidance regarding how proposals for new pipeline construction would be reviewed. This statement established criteria for determining whether a project is needed and is in the public interest, and identified the FERC’s objectives such as balancing public benefits against potential adverse consequences; giving appropriate consideration to the enhancement of competitive transportation alternatives; and avoiding unnecessary disturbance to the environment.⁷⁶ In addition, in a Policy Statement the FERC set forth guidance regarding state and local reviews and approvals of interstate pipeline facilities.⁷⁷

The Federal Power Act of 1935 (16 U.S.C. §791(a)) gives the FERC jurisdiction over the transmission of electric energy in interstate commerce, wholesale energy transactions, and all facilities for such transmission. However, unlike federal authority over interstate pipelines, states reserve jurisdiction over the siting of electric transmission and generation facilities.

NEPA provides the primary framework for environmental review at the federal level. The FERC policy requires applicants to cooperate with state and local agencies with respect to their respective permitting requirements, but notes that such agencies may not prohibit or unreasonably delay a project that has been issued a certificate by the FERC.

The FERC environmental review process provides the opportunity for public review of and comment on a project, and is intended to incorporate the views of federal, state, and local agencies. In addition, for some projects, certain federal agencies act as cooperating agencies, assisting the FERC directly in the environmental review process and providing direct input to the preparation of the FERC’s EIS on a project. Principal elements of the FERC regulatory process include:

FERC Application. In a FERC application, a project proponent must include various exhibits, including gas flow calculations, rates, financing, and an environmental report (ER). In the ER, the project applicant details the location of the proposed route and alternatives, as well as route-specific environmental conditions, anticipated impacts, results of special studies (i.e., benthic resources) and proposed mitigation measures. The ER must conform to the FERC regulations regarding compliance with NEPA (18 CFR Section 2.82) and the FERC’s “Guidelines for the Preparation of Applicant’s ERs for Application Under Section 7(c) of the Natural Gas Act.” An ER is typically prepared using the

⁷⁵ M & N Pipeline, 81 FERC Paragraph 61-166 (1997).

⁷⁶ The FERC, March 2002, Islander East Pipeline Project Draft Environmental Impact Statement, Docket No. CP01-384-000, Washington, D.C., p.1-1 and Certification of New Interstate Natural Gas Pipeline Facilities, Statement of Policy No. PL99-3-000, 88 FERC Paragraph 61, 227 (September 15, 1999).

⁷⁷ Maritimes and Northeast Pipelines, 81 FERC Paragraph 61, 166 (1997)

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individual “resource report” format, which has facilitated the FERC’s reviews of projects since the late 1980s.

FERC EIS. After receipt of the ER and detailed route maps, the FERC initiates the application and environmental review process, which includes the preparation of an EIS. The EIS can be prepared by the FERC staff, the FERC consultants, or third party consultants who are paid by the applicant but report to the FERC.

The FERC prepares both a Draft and a Final EIS. A public scoping meeting typically is held at the initiation of the FERC EIS process to solicit public and agency comments on the project. The Draft EIS also is circulated for public and agency review, after which a public hearing is held. The Final EIS reflects the incorporation of responses to agency and public comments on the project, and includes a list of required mitigation measures, which subsequently become conditions in the FERC certificate. Prior to obtaining the FERC construction clearance, project applicants must identify how compliance with each of the mitigation measures will be accomplished.

Typically, compliance with state-delegated 401 water quality requirements, coastal zone consistency certifications, and historic preservation legislation must be demonstrated before a federal agency can take an action, such as issuing a certificate. However, in the past, the FERC has issued certificates conditional on the applicant receiving such necessary permits and approvals.

FERC Involvement During Construction/Restoration. Prior to construction, the FERC requires that project sponsors demonstrate the methods that will be used to inform construction contractors about environmental requirements and monitor the contractors’ conformance to such measures. During construction, the FERC staff or its designees (i.e., a third party environmental consultant) routinely conduct field inspections and enforce compliance with certificate requirements. Special field inspections also may be performed if there are repeated problems with contractor compliance or concerns expressed by other agencies or the public.

Army Corps of Engineers

The principal federal permitting agency for cross-Sound electric cable and telecommunications projects is the ACOE. Other federal agencies, including the USFWS, NMFS, and EPA, comment on the ACOE permit review, on the FERC review (in the case of interstate natural gas pipelines), or both. An ACOE permit is required for FERC-regulated projects as well; however, in such cases, the FERC is the lead federal agency.

Two ACOE regions have jurisdiction over Long Island Sound: the New England District of the ACOE has jurisdiction over Connecticut, whereas the New York District of the ACOE has jurisdiction over New York. For interstate projects, the ACOE districts typically determine which will take the lead role; that district then coordinates the project

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review process and, as appropriate, a single permit is issued for the entire project. The ACOE typically coordinates project reviews closely with other involved resource agencies, such as DEP, NYSDEC, USFWS, NMFS, and EPA. Two EPA regions (Region 1 headquartered in Boston and Region 2 headquartered in New York City) also have jurisdiction over Long Island Sound.

For cross-Sound projects, ACOE permits are required under Section 10 of the Rivers and Harbors Act pertaining to construction in navigable waters and under Section 404 of the Federal Clean Water Act pertaining to the discharge of dredged or fill material into the waters of the United States. A single application is typically submitted for the Section 10/404 permits.

For projects involving activities in Long Island Sound, the ACOE typically requires the performance of detailed studies of the project area as part of the permit application process. Such studies may include, for example, benthic surveys, sediment sampling and analysis, sediment transport modeling, and marine cultural resource investigations, among others.

After receipt of a permit application, the ACOE issues a public notice stating the nature of the project, and requesting comments from other federal and state agencies and the public. After the ACOE has received input from the other reviewing agencies and the public, it decides on the need for a public hearing.

ACOE permits typically include a variety of project-specific permit conditions that are designed to minimize adverse environmental and navigational impacts through the imposition of measures such as construction timing restrictions, the use of particular construction and restoration methods, and environmental monitoring. The ACOE cannot issue a permit unless state coastal zone consistency and 401 water quality certifications are received from DEP and the appropriate New York agencies.

2.2.4 Connecticut Jurisdiction and Certification/Permit Criteria

Connecticut Siting Council

In 1971, the Connecticut General Assembly adopted PUESA. Prior to the effective date of this legislation, the Department of Public Utility Control (DPUC) had sole responsibility for reviewing the prudence and siting of utility proposals for transmission, generation, and other infrastructure projects. Under PUESA, however, Connecticut articulated its obligation to balance public need and benefit with environmental protection. PUESA delegated siting decisions to an independent body, the Siting Council, prescribed an adjudicatory procedure for project review, and established certification criteria.

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PUESA prescribes the criteria that the Siting Council must consider in issuing a certificate. With respect to electric transmission lines substantially underground or underwater, the Siting Council shall not issue a certificate unless it finds and determines a “public benefit” for the facility and that this public benefit outweighs the adverse effects of the project, including cumulative effects.⁷⁸ A “public benefit” exists if the facility “is necessary for the reliability of the electric power supply of the state or for the development of a competitive market for electricity.”⁷⁹

With respect to gas pipelines, the Siting Council’s role is limited. Additional information concerning the responsibilities of the Siting Council and the roles that other state agencies play in the Siting Council process is included in Section 2.7 of the Assessment Report Part 1.

Other Connecticut Regulatory Requirements

A number of state permits and certifications apply to proposed developments in Long Island Sound. State regulatory requirements are discussed in detail in Section 2.6.7 of the Assessment Report, Part I. The primary state authorizations relevant to projects in Long Island Sound are summarized as follows.

Coastal Management Act - Connecticut’s CMA establishes a statewide policy of planned coastal development and authorizes towns to administer local coastal management programs. This program is administered by the DEP Office of Long Island Sound Programs (OLISP). The CMA lists a number of criteria related to structures, dredging and fill that the OLISP must consider, including:

Requiring structures in tidal wetlands and coastal waters to be designed to minimize harm to coastal resources, circulation, sedimentation, water quality, flooding, and erosion;

Disallowing filling of tidal wetlands and near shore, offshore, and intertidal waters to create new land which is otherwise undevelopable;

Disallowing new dredging in tidal wetlands, except where no feasible alternative exists or where adverse impacts to coastal resources are minimal;

Requiring that access to public beaches below the mean high water mark not be unreasonably impaired by structures including jetties, groins, and breakwaters;

Encouraging the removal of illegal structures below mean high water that obstruct passage along the beach; and

⁷⁸ CGS Section 16-50p(c)(2).

⁷⁹ CGS Section 16-50p(c)(2).

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Maintaining, enhancing, or restoring natural water circulation patterns and fresh and saltwater exchange (CGS Section 22a-92).

When making a decision on a permit application, OLISP must also consider factors such as: the potential effect on the area's natural resources, including, but not limited to, plant and animal species, the prevention or alleviation of shore erosion and coastal flooding, the use and development of all adjoining lands, the improvement of coastal and inland navigation for all vessels, the interests of the state in such areas as pollution control, water quality, recreational use of public water, and management of coastal resources, and the rights and interests of all persons concerned with the proposed activity.

Pursuant to the federal Coastal Zone Management Act of 1972 (16 USC § 14-51, *et seq.*) and under its federally approved Coastal Zone Management Program, DEP has the responsibility to determine if the issuance of a federal permit or certificate (i.e., the FERC or ACOE authorizations) that would impact Connecticut's coastal zone is consistent with the state's coastal management program.

Structures/Dredging and Fill Permit - Any project proposing to dredge, fill, obstruct, encroach, erect or maintain any structure or perform work incidental to such activities seaward of the high tide line in tidal, coastal, or navigable waters of the state must apply for a DEP permit (CGS Section 22a-361). The law requires DEP to consider the effect of proposed activities on: (1) indigenous aquatic life, fish, and wildlife, (2) preventing or alleviating shore erosion and coastal flooding, (3) the use and development of adjoining uplands, (4) improving coastal and inland navigation, (5) use and development of adjacent lands, and (6) the state's interests including water quality, recreational uses, and coastal resource management (CGS Section 22a-359).

Tidal Wetlands, Inland Wetlands and Watercourses - Anyone proposing to conduct a regulated activity in a tidal wetland must apply for a permit from DEP (CGS Section 22a-28 *et seq.*). Regulated activities, as defined in CGS Section 22a-29(3), include draining, dredging, and excavation, directly or indirectly in a tidal wetland, and building structures, driving pilings, or placing obstructions. DEP may grant, deny, or limit the permit, based on a consideration of the effects of the proposed activity on the public health and welfare, marine fisheries, shellfisheries, wildlife, protection of life and property from floods, hurricanes, and other natural disasters, and other public policy considerations set out in the tidal wetland statutes (including, under CGS Section 22a-28, preservation of wetlands to protect marine commerce, fisheries, recreation, and aesthetic enjoyment). In addition to the statutory criteria for each permit, the law requires DEP to administer all coastal permitting programs in accordance with the goals and policies of the CMA. Regulated activities in inland wetlands and watercourses are subject to the provisions of CGS Section 22a-36 *et seq.*

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Section 401 of the Clean Water Act (State Water Quality Certification) - An applicant for a federal license or permit (i.e., an ACOE permit or FERC certificate) to conduct an activity that may result in a discharge into waters of the U.S. must obtain a state 401 water quality certification. Such activity or discharge must be consistent with the provisions of the federal Clean Water Act and with the Connecticut Water Quality Standards. In reviewing requests for water quality certification, DEP must consider the effects of proposed discharges on ground and surface water quality, and on existing and designated uses of the waters of the state.

Cultural Resources Protection. NEPA requires an evaluation of the potential impacts of a proposed project on historic and archaeological resources, including submerged cultural sites. In addition, NHPA establishes a National Register of Historic Places (Historic Register) and requires that all federal agencies consider the effect of their action on properties eligible for listing in the Historic Register. This evaluation is the responsibility of the State Historic Preservation Officer (SHPO), which each state is required to have by NHPA. Thus, federal agency review processes, including those of the FERC and the ACOE, must incorporate cultural resource evaluation and protection measures, pursuant to the NHPA.

The Connecticut Historical Commission (CHC) is responsible under state statute for overseeing the protection of the state's cultural resources. The CHC's Executive Director is the designated SHPO required under NHPA. The legislature created the CHC to, among other things, study, investigate, and encourage the preservation of historic resources, including archaeological sites (CGS Section 10-321). Under CGS Section 10-321(b)(13) the CHC may "review planned state and federal actions to determine their impact on historic structures and landmarks...." Historic structures and landmarks are defined to include "sacred sites and archaeological sites." Pursuant to PUESA, the CHC is among the Connecticut agencies designated to comment on all projects before the Siting Council.

2.2.5 New York Jurisdiction and Certification Criteria

New York Public Service Commission

Unlike Connecticut, New York has separate siting laws pertaining to electric generation facilities and to intrastate natural gas and electric transmission facilities.

The state laws applicable to electric transmission siting and electric generation facilities are Article VII and Article X of the New York Public Service Law, respectively. Article VII governs the siting of major utility transmission facilities,⁸⁰ and requires a project

⁸⁰ Generally defined as an electric transmission line of a design capacity of 125 kV or more extending a distance of one mile or more, or 100-125 kV and extending more than 10 miles (excluding certain

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proponent to obtain a Certificate of Environmental Compatibility and Public Need from the New York Public Service Commission (NYSPSC) to construct such a facility. Article VII does not apply to any major utility transmission facility, such as an interstate gas pipeline, over which the FERC has exclusive jurisdiction.⁸¹ However, the NYSPSC typically participates in the FERC regulatory review process.

Under Article VII, applications for major transmission facilities subject to the law are filed with the NYSPSC, which has sole jurisdiction for issuing certificates. Other New York and local agencies typically participate in the Article VII process, which is broadly similar to that of the Siting Council. By law, the NYSPSC may not issue a certificate unless it finds and determines:

- (a) the basis of the need for the facility;
- (b) the nature of the probable environmental impact;
- (c) that the facility represents the minimum adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives, and other pertinent considerations including but not limited to, the effect on agricultural lands, wetlands, parklands and river corridors traversed;
- (d) in the case of an electric transmission line, (1) what part, if any, of the line shall be located underground; (2) that such facility conforms to a long-range plan for expansion of the electric power grid of the electric systems serving this state and interconnected utility systems, which will serve the interests of electric system economy and reliability;
- (e) in the case of a gas transmission line, that the location of the line will not pose an undue hazard to persons or property along the area traversed by the line;
- (f) that the location of the facility, as proposed, conforms to applicable state and local laws and regulations issued thereunder, all of which shall be binding upon the commission, except that the commission may refuse to apply any local ordinance, law, resolution or other action or any regulation issued thereunder or any local standard or requirement which would be otherwise applicable if it finds that as applied to the proposed facility such is unreasonably restrictive in view of the existing technology, or of factors of cost or economics, or of the needs of consumers whether located inside or outside of such municipality; and

underground lines); or a fuel gas transmission line extending a distance of 1,000 feet or more to be used to transport fuel gas at pressures of 125 psi or greater (excluding underground lines less than one mile that replace existing lines).

⁸¹ Public Service Law Article VII Section 121.4.

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(g) that the facility will serve the public interest, convenience, and necessity.⁸²

Additionally, with respect to an “electric transmission line to be constructed by the New York Power Authority (NYPA) and located in part under the waters of Long Island Sound and for the remaining part underground, the commission shall make only the findings and determinations required by paragraphs (b), (c) and (f)....” Under this exemption, NYPA projects beneath Long Island Sound are not required to meet the “needs” test. Merchant electric transmission projects are not explicitly afforded the same exemption.

Other New York Agencies with Jurisdiction Over Long Island Sound

In addition to the NYSPSC, several other state agencies administer regulatory programs that pertain to projects in Long Island Sound. These agencies are briefly identified below:

NYSDEC. This agency administers the state’s environmental regulatory programs, including those concerning tidal wetlands; Section 401 water quality certifications; and air, water, and biological resources. NYSDEC typically participates in the Article VII process for electric transmission facilities. However, unlike DEP, it does not have independent permitting authority over electric transmission facilities. For FERC-regulated interstate natural gas pipeline projects, which are not subject to NYSPSC jurisdiction, the NYSDEC is usually the lead state permitting agency. The NYSDEC also typically coordinates with the involved federal agencies, such as the FERC and the ACOE.

NYSDOS. The NYSDOS is responsible for administering the state’s coastal zone management program, including the review of coastal consistency applications.

NYSHPO. The New York Office of Parks, Recreation and Historic Preservation acts as the NYSHPO and is responsible for overseeing the protection of the state’s cultural resources. The SHPO in New York has the same functions as those described above for the SHPO in Connecticut.

2.2.6 Long Island Sound Management Programs

Long Island Sound’s resources are directly influenced by land use patterns and management in nearby upland areas, such as discharges from sewage treatment plants, storm sewers, and non-point sources of pollution. The State of Connecticut has invested considerable effort in assessing and managing Long Island Sound. In addition, through implementation of the Connecticut Coastal Management Program, DEP strives to balance the protection of coastal resources with maintaining the state’s economic investment in

⁸² New York Consolidated Laws Public Service Article VII Sec. 126.

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water dependent uses in the coastal area. Some areas addressed by the program include: public access, harbor management, coastal habitat restoration, coastal permitting, municipal development, urban waterfront revitalization, and protecting the public trust. As a result of the Coastal Management Program, over 13.9 miles of public access have been added and 1,600 acres of tidal wetland have been restored.

Other Long Island Sound management programs include the LISS and the CCMP referenced earlier. Active participants include federal, New York and Connecticut government officials, researchers, user groups and other concerned organizations and individuals. The partners recently signed the Long Island Sound 2003 Agreement pledging their continued commitment to goals of the CCMP and the conservation and management of Long Island Sound.

2.3 REGIONAL ENERGY NEEDS AND INFRASTRUCTURE

In general terms, PA No. 02-95 requires the Task Force to examine approaches for avoiding or minimizing construction of new energy and telecommunications infrastructure across Long Island Sound, and evaluating the reliability and operational impacts to the state and region attributable to such limitations on new cross-Sound infrastructure. To address these issues, it is imperative to first understand the energy needs and existing infrastructure within Connecticut and the region. In the context of protecting Long Island Sound, the "region" specifically includes both Connecticut and Long Island. As an island, nearly all of Long Island's fuel portfolio used for heating, transportation, industrial production, and electrical generation must be imported by tanker, barge, truck, or pipeline across the surrounding bodies of water. Long Island's indigenous energy supplies are at present, limited to solar power, solid waste and landfill gas, wind, and other potential renewable energy sources, which can meet only a small percentage of Long Island's energy requirements. Long Island also relies on electric cable interconnections with Connecticut and New York City across Long Island Sound and the East River, respectively. For these reasons, an evaluation of alternatives or limitations to new Long Island Sound energy infrastructure crossings must be based in part on an understanding of Long Island's energy demand, generation capacity, fuel sources, imports, and the electric and gas transmission infrastructure serving Long Island, and to a certain extent, the adjacent New York City boroughs of Queens and Brooklyn.

In the Assessment Report Part I, the energy infrastructure and reliability of SWCT was discussed in the context of the state's resources within the New England electric grid, operated by New England's Independent System Operator (ISO-NE). This section of the Assessment Report Part II, which summarizes the Connecticut information previously presented in Part I, presents equivalent information for Long Island, and focuses on the electric and gas interconnections between Connecticut and New York.

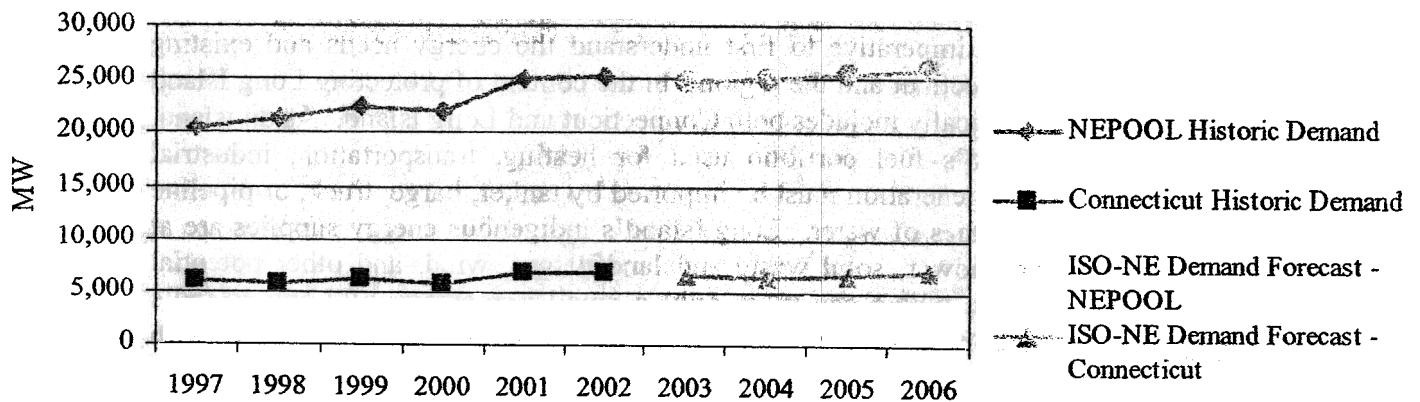
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2.3.1 Electric Reliability in Connecticut

Electric Load

Connecticut comprises approximately 27% of the peak electric load and approximately 26% of the total electric consumption in New England. Figure 1 shows the growth in Connecticut's peak load as well as New England since 1997. While Connecticut's customer load has been increasing over time, unusually hot and humid weather during the summers of 2001 and 2002 contributed significantly to the accelerated peak load growth. In 2001, Connecticut's summer peak load was 6,799 MW, exceeding the prior year's record peak by 899 MW. The 2001 record peak load was eclipsed in 2002 when the new record of 6,884 MW was set on July 3, 2002. ISO-NE forecasts that the state's peak load will reach 7,023 MW by 2006 under normal weather conditions as the state's population and economy grow.⁸³

Figure 1 – Historic Peak Load Growth in Connecticut and New England



Region-wide, the peak load in New England reached 25,348⁸⁴ MW during the summer of 2002, 1,148 MW greater than the peak demand of 24,200 MW forecasted by ISO-NE earlier in the year under normal weather conditions, but 152 MW less than the 25,500 MW peak demand forecasted by ISO-NE under extreme weather conditions. During this decade, ISO-NE expects regional peak load to grow at an annual rate of 1.6% from 2001 to 2011.⁸⁵

Connecticut's utilities are required to forecast incremental total electricity consumption and provide such information annually to the Siting Council. According to the Siting

⁸³ ISO-NE *Technical Assessment of the Generating Resources Required to Reliably Operate Connecticut's Bulk Electric System 2003 and 2006*. Final Report. System Planning, January 29, 2003.

⁸⁴ ISO-New England.

⁸⁵ ISO-NE, *2002 Capacity Energy Load and Transmission (CELT) Report*, April 1, 2002.